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# MEGACEROPS TYLERI, A NEW SPECIES OF TITANOTHERE FROM THE BAD LANDS OF SOUTH DAKOTA

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(WITH PLATES III AND IV)

The Amherst College Palæontological Expedition of 1903, under the leadership of Professor F. B. Loomis, was remarkably fortunate in securing the greater part of a huge titanotheres, apparently representing a species unknown to science which, aside from this, has the additional value of having the skull and limbs of one individual associated beyond doubt. The specimen was therefore deemed worthy of careful description, the privilege of which has been granted the writer through the courtesy of Dr. Loomis.

## GEOGRAPHICAL AND GEOLOGICAL LOCALITY

The specimen was found by Mr. T. C. Brown, Amherst College 1904, near the head of Bear Creek, a tributary of the Cheyenne River in South Dakota. The exact locality was on the north side of Spring Draw basin, about ten miles from the mouth of Bear Creek. Here some two hundred feet of titanotheres beds were found, lying upon Fort Pierre deposits, in which titanotheres bones were discovered from a point six feet above the contact upward; the specimen under consideration lying thirty-five feet above the base of the beds, hence in the upper part of the lower division.<sup>1</sup>

If one may judge from the summary of characters given by Hatcher and others, the specimen would be considered a middle-bed form with some upper-bed characteristics, as it is far from being primitive.

## CHARACTER AND CONDITION OF THE SPECIMEN

The skeleton, which is No. 327 of the Amherst College Zoölogical Collection, consists of a skull and jaws, the atlas, axis, and the fourth, fifth, and sixth cervical vertebræ. Nine dorsals, most of them spine-

<sup>1</sup> J. B. Hatcher, *American Naturalist*, Vol. XXVII (1893), p. 218.

less, are preserved, together with thirteen ribs. The lumbar, sacral, and caudal vertebræ are missing. Of the fore-limbs the proximal end of the left and the distal end of the right scapular are preserved, together with the distal ends of both humeri and the proximal end of the right.

The radius and ulna of the left limb and fragments of the right ulna represent the second segment; while of the manus all the bones of the right, except the pisiform, the trapezoid, and a few phalanges, are preserved, the left being less perfect, but supplementing the first so that, with the exception of a part of the humerus, our knowledge of the entire limb is complete.

The hind limbs are more complete, as both femora, tibiæ, and fibulæ are preserved most admirably. Of the pes, that of the left limb is perfect as to the tarsus, while the right lacks only the ecto-cuneiform, that of another specimen being substituted in the mount. Both metatarsi are perfect, though several phalanges are missing. A number of sesamoids of both manus and pes are preserved, together with the left patella.

With the exception of the vertebral spines, the bones are for the most part in admirable condition, though the skull and jaws have been subjected to a peculiar shearing strain, which has brought the left side in advance of the right, as shown in the figures.

#### DETERMINATION OF THE SPECIES

The specimen under consideration is evidently a *Megacerops*, as the generic characters given by Osborn<sup>1</sup> and by Marsh<sup>2</sup> are well marked. The skull is moderately brachycephalic, with expanded zygomata; the horns are rather short, without a prominent connecting-crest, oval at the summit and transversely elongate oval at the base. The nasals are of moderate length, with well-rounded extremities. The dental formula is  $I.\frac{2}{2}$ ;  $c.\frac{1}{1}$ ;  $p.\frac{4}{4}$ ;  $m.\frac{3}{3}$ ; the two median superior and all of the lower incisors being represented by deep unclosed sockets, as though the teeth had been lost after death. There is a diastema behind the canines, and the internal premolar cingulum is less pronounced in the center of the tooth.

<sup>1</sup> H. F. Osborn, *Bulletin of the American Museum of Natural History*, Vol. XVI (1902), Art. VIII, p. 96.

<sup>2</sup> O. C. Marsh, *American Journal of Science* (3), Vol. XI (1875), p. 245.

Specifically the creature most nearly resembles *Megacerops bicornutus* Osborn and *Megacerops (Diploclonus) amplus* Marsh, having certain characters suggestive of each; but there are enough important differences to render it distinct and to warrant the erection of a new species for its reception.

***Megacerops tyleri* sp. nov.**

Type No. 327 of the Amherst College Zoölogical Collection. Horns well in front of orbits, directed somewhat forward and outward, an elongate oval in basal section with the long axes in line, rounded oval at the summit. Hornlets quite conspicuous, on the inner face of the horns midway between the base and summit. Connecting-crest low and inconspicuous. Nasals broad, well rounded in front, and but slightly arched beneath. Zygomata expanded and deep, with a well-rounded outer face. Dentition: Superior incisors represented by the deep and well-defined median alveoli, and by the lateral teeth which remain in place, and which have hemispherical crowns which show little sign of wear. The canines are lanceolate, with a well-developed postero-internal cingulum. There is a short diastema in front of, and a longer one behind, the canine. Premolars with a smooth internal cingulum, less pronounced in the middle of the tooth, and with no external cingulum. The deuterocone is well developed, while the tetartocone, especially of premolar four, is inconspicuous.

The jaw is deep and robust, with the alveoli of two incisors, probably of the second and third, deep and distinct. There is no space between the lateral incisors and the canine, though between the two median alveoli a considerable gap occurs. There seems to have been a small diastema behind the lower canines, which are lanceolate, though with a less prominent cingulum, and not so strongly recurved as the upper ones.

COMPARISON WITH ALLIED SPECIES

The form under consideration resembles most closely *Megacerops (Diploclonus) amplus* Marsh and *M. bicornutus* Osborn, agreeing with both in the possession of hornlets, and with one or the other in minor characters, but differing in general contour of the skull and horns. The table on next page shows the main points of resemblance or contrast in the three species.

Professor Osborn, in his description of *M. bicornutus*, mentions as a cotype skull No. 1081 of the American Museum—a specimen with a somewhat checkered career, as it was first described and figured by Osborn in the *American Museum Bulletin*<sup>1</sup> as “*Titano-*

<sup>1</sup> Vol. VIII, Art. IX, pp. 176, 177.

<i>M. tyleri</i> , n. sp. Type No. 327, Amherst College	<i>M. bicornutus</i> , Osb. <sup>1</sup> Type No. 1476 A. M. N. H.	<i>M. amplus</i> , Marsh <sup>2</sup> Type in Yale Museum
Skull rather broad. Zygomata expanded. Outer face of zygomata rounded. Horns directed forward. Basal section elongate transverse oval. Hornlets on inner face half way to summit. Connecting-crest low. Nasals broad, relatively short, rounded extremities. Nasals not highly arched beneath. Malar bridge not conspicuously sharp. Canines lanceolate. Diastema behind canines. Premolars without external cingulum.	Skull narrow. Not expanded. Rounded. Nearly erect. Slightly oval sub-transverse. On anterior face less than half way to summit. No connecting-crest. Narrow, relatively elongate. Highly arched beneath. Sharp malar bridge in front of orbit. Rounded. No diastema. With external cingulum.	Skull rather broad. Expanded. Acute. Directed forward. Compressed transversely. On inner face, one-third way to summit. Connecting-crest high. Short and narrow. Sharp ridge at base of horn core on the outside. Lanceolate. No diastema. With external cingulum.

*therium torvum* (or *robustum*).” This skull resembles that of the specimen under consideration in general proportions, though in the former the horns are longer and more projecting. The teeth are badly worn and broken, but the one remaining premolar lacks the cingulum on the outside, as in the Amherst specimen. The canines are lacking, so that their character cannot be ascertained. Professor Osborn accounts for the differences between the type, No. 1476, and No. 1081 by the assumption that the former is a female skull, while the latter is that of a male. He states, however, that “the shape of the canines is the same in both sexes, but the male tusks are much more powerful than in the female.”<sup>3</sup> Between the lanceolate canine of *M. tyleri* and the rounded canine of the *M. bicornutus* type there would seem to lie a specific distinction which, together with the other differences mentioned in the table above, would probably bring No. 1081 into the new species.

<sup>1</sup> H. F. Osborn, *loc. cit.*, p. 99.

<sup>2</sup> O. C. Marsh, *American Journal of Science* (3), Vol. XXXIX (1890), p. 523, Fig. 5; figured by Osborn, *loc. cit.*, Fig. 7.

<sup>3</sup> *Loc. cit.*, p. 173.

## GENERAL DESCRIPTION

*The skull* (Plate III, Figs. 1-4).—The skull was partially exposed as it lay in the quarry, so that the occiput and the left zygomatic arch have been destroyed by weathering. The remainder is in admirable preservation, except for the distortion noted above. In spite of the fact that the union of the epyphises with the vertebral centra is as yet imperfect, which, as Marsh has shown, occurs rather late in the titanotheres as in the elephants, the sutures are almost obliterated from the skull, as one can only distinguish the squamoso-jugal suture

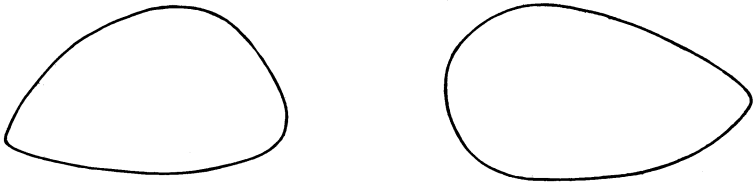


FIG. 1.—Basal section of the horns of *Megacerops tyleri* taken in a plane perpendicular to their axes. One-quarter natural size.

of the zygomata, and that on the inferior side of the nasals. The general contour of the horns is well shown in Plate III, Fig. 3, and in the sections here shown, though allowance must be made for the crushing backward of the right and the crushing forward of the left horn.

Toward the summit the horns become rounder in section, and they terminate in a much-roughened area, which is somewhat flattened, and which Osborn describes as “incompletely ossified.” Another roughening of a similar character, though not so pronounced, marks the summit of each hornlet, and there is an entire absence of any vascular impressions over the surface of the horn, as in the horn cores of the hollow-horned artiodactyls and the *Ceratopsia* among dinosaurs. This leads the author seriously to doubt the accuracy of those restorations of the animal wherein these prominences are represented as sheathed with horn. On the contrary, it would seem, from the similarity of the roughened patches to those on the rhinoceros nasals, as though the entire prominence had been clothed with skin

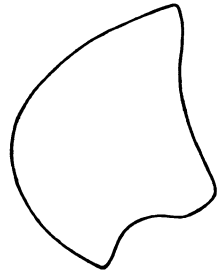


FIG. 2.—Vertical section through the zygomatic arch at the point of its greatest expansion. One-quarter natural size.

with two rhinoceros-like horns, a larger one at the apex and a smaller one on the summit of the hornlet.<sup>1</sup>

The missing portions of the skull have been restored from photographs of the American Museum skull No. 1081, already alluded to, which were loaned through the courtesy of Professor Osborn.

The skull measurements are as follows:

Premolar-molar tooth series	-	-	-	-	-	-	-	0.363
Premolars	-	-	-	-	-	-	-	.139
Molars	-	-	-	-	-	-	-	.227
Canine (crown) anterior length	-	-	-	-	-	-	-	.045
Canine (crown) antero-posterior diameter	-	-	-	-	-	-	-	.035
Premaxillaries to condyles (estimated)	-	-	-	-	-	-	-	.768
Nasals to mid-vertex (estimated)	-	-	-	-	-	-	-	.740
Transverse width of zygomatic arch	-	-	-	-	-	-	-	.583
Depth of zygomatic arch (buccal process)	-	-	-	-	-	-	-	.157
Nasals, free length	-	-	-	-	-	-	-	.084
Nasals, free breadth,	-	-	-	-	-	-	-	.140
Outside length of horn	-	-	-	-	-	-	-	.170
Expanse of horns	-	-	-	-	-	-	-	.393

Those of the jaw are:

Length, symphysis to condyle	-	-	-	-	-	-	-	0.685
Premolar-molar tooth series	-	-	-	-	-	-	-	.375
Premolars	-	-	-	-	-	-	-	.140
Molars	-	-	-	-	-	-	-	.235
Canine (crown) anterior length	-	-	-	-	-	-	-	.042
Canine (crown) antero-posterior diameter	-	-	-	-	-	-	-	.031
Depth of jaw	-	-	-	-	-	-	-	.355

In the lower premolar series a tooth is missing on each ramus, on the left the first, and on the right the second premolar, the missing ones being indicated by their roots. The molar series is well developed below and above, the hypocone of the third superior molar being well formed.

*The atlas.*—The atlas is a broad, heavy bone, with wide articular facets and expanded transverse processes. The spine is extremely low, and the short truncated hypopophysis extends backward. Of the foramina, only that for the dorsal root of the first cervical nerve is present, the ventral one, well shown in *Palaeosyops*,<sup>2</sup> being here

<sup>1</sup> Restoration of the Titanotheres Megacerops. R. S. Lull, *American Naturalist*, Vol. XXXIX (July, 1905), p. 423, Figs. 2, 3.

<sup>2</sup> Charles Earl, *Journal of the Academy of Natural Science*, Philadelphia, Vol. IX, 2d series, Art. VI, p. 294.

represented by a deep notch as in the rhinoceros, which our specimen also resembles in the lack of a vertebrarterial canal and in the relative widths of the anterior and posterior facets.

The dimensions of the atlas are:

Total width	-	-	-	-	-	-	-	-	0.320
Width across atlar-occipital facets	-	-	-	-	-	-	-	-	.204
Width across atlar-axis facets	-	-	-	-	-	-	-	-	.255

*The axis.*—The axis is a massive bone with a high neural arch, the spine being an equilateral triangle in mid-section. On its posterior face a shallow groove arises between the zygapophyses which fades out about two-thirds of the way to the summit. The prezygapophyses overhang the atlas in front, but present no articular facets. The odontoid process is a truncated cone, and is not so prominent relatively as in Palæosyops, being about one-third the length of the centrum measured along its inferior face. The latter exhibits a low longitudinal ridge below, but is not deeply excavated on either side, as in Palæosyops. The transverse processes of the specimen are broken away, but the bases of its two supports are seen, indicating the position of the vertebrarterial canal, which is placed rather high on the centrum, though not on a line with its upper surface, as is Palæosyops.

The postzygapophyses look downward and outward; their horizontal axes, if continued, would intersect at an angle of 90°. Altogether both atlas and axis resemble those of a rhinoceros much more than those of Palæosyops.

The measurements of the axis are as follows:

Total height to summit of spine	-	-	-	-	-	-	-	0.295
Greatest breadth	-	-	-	-	-	-	-	.241
Length of centrum including odontoid	-	-	-	-	-	-	-	.133

The remaining *cervicals* are distinctly opisthocœlous, with zygapophyses which widely overlap one another. With the exception of the sixth, they are quite poorly preserved, and the sixth is so badly crushed as to make measurements very unreliable.

Of the *dorsals*, nine only are referable to the type specimen, though three others are added in the mount. The opisthocœlous centra are preserved, but the spines and transverse processes are lacking.

*The ribs.*—Portions of thirteen ribs from both sides of the body



are preserved. In general form they are quite rhinoceros-like, being somewhat widely expanded in the shaft. The capitulum is nearly spherical in most of the ribs preserved, and the two facets are separated from each other by a deep groove. In an anterior rib, the second or third, the tubercular facet, while mainly on the posterior side, arches over so as to lie in part on the anterior face. The other ribs have the tubercular facet entirely on the posterior face. The resemblances again are with the rhinoceros rather than with *Palæosyops*.

#### THE APPENDICULAR SKELETON

*Fore-limb*.—While both scapulæ are incomplete, they supplement each other so that our knowledge of them is fairly perfect. The proximal half of the left with its spine is well preserved, while of the right nearly the entire distal border is present.

The glenoid is deeply concave antero-posteriorly, and is broadly elliptical in outline. The corocoid process is conical, somewhat downwardly curved at the tip, separated by a deep notch from the glenoid border, and not arising directly from it, as in *Palæosyops*, but separated by an interval of 0.038 m. The spine is high in the middle, with a broad roughened border. It lowers insensibly into the general level of the scapular face above and below, with no indication of an acromion. The tuberosity is not very pronounced, and the distal border is nearly straight.

The dimensions of the scapula are:

Total length (estimated)	-	-	-	-	-	-	-	0.690
Width of superior border (estimated)	-	-	-	-	-	-	-	.405
Fore and aft diameter of glenoid fossa	-	-	-	-	-	-	-	.133
Height of spine	-	-	-	-	-	-	-	.095

*The humerus*.—The distal portions of both humeri are preserved, but of the proximal portions that of the right only, and as there is a portion of the shaft missing, the length cannot be measured. The distal end is broad and heavy, the external condyle being especially prominent and roughened for muscular attachment. The inner trochlear is much the larger and is higher than the outer one, thus indicating an outward flexing of the elbow joint. The aconeal fossa is large and deep, but there is no foramen. The breadth of the extremity measured at right angles to the axis of the shaft is 0.210.

Breadth of shaft	-	-	-	-	-	-	-	-	0.085
Fore and aft diameter of shaft	-	-	-	-	-	-	-	-	.077

*The radius.*—That of the left side is well preserved, except that its distal end is somewhat weathered. It is not notably heavy, and has a well-rounded shaft, but slightly compressed fore and aft at the distal end. The radio-scaphoid facet is prolonged upward on the posterior face, indicating a considerable range of flexion of the wrist.

The principal dimensions of the radius are:

Length	-	-	-	-	-	-	-	-	0.490
Antero-posterior diameter of mid shaft	-	-	-	-	-	-	-	-	.060
Lateral diameter of mid shaft	-	-	-	-	-	-	-	-	.065
Lateral diameter of lower end	-	-	-	-	-	-	-	-	.110

*The ulna.*—The entire left and fragments of the right are preserved, except for the distal end of the former, which is badly weathered. The ulna is notable for its huge compressed olecranon, which widens out distally into a heavy roughened tubercle.

The ulna measurements are as follows:

Length (estimated)	-	-	-	-	-	-	-	-	0.620
Antero-posterior diameter of olecranon from the humeral facet	-	-	-	-	-	-	-	-	.170
Lateral diameter of olecranon tubercle	-	-	-	-	-	-	-	-	.140
Fore and aft diameter of mid shaft	-	-	-	-	-	-	-	-	.080
Lateral diameter of mid shaft	-	-	-	-	-	-	-	-	.080

*The manus* (Plate IV, Figs. 1-3).—The general proportions well shown in the figure, are somewhat broad rather than slender and in direct correlation with the proportions of the skull. As has often been stated, the manus shows some distinctly artiodactyl features, the most notable being the retention of four digits with the main axis between digits 3 and 4, rather than lying in the third itself. Another remarkable feature is the extreme flexibility of the carpus, especially in the development of a true ginglymoid joint between the proximal and distal row of carpals. This is paralleled in the carpus of *Rangifer caribou*, and is quite distinct from the condition found in the horse and camel, where, while the proximal facets of the distal carpalia indicate a certain range of flexion, there is no development of special pulley-like ridges or keels, as in the titanotheres and caribou. How this articulation is formed in the rhinoceros and tapir the author unfortunately has not had the opportunity to observe, but a compar-

ison would be most interesting. All of the elements are present in the carpus, with the exception of the trapezium, of which the last vestige has disappeared. The proximal facets are shown in Fig. 1 of Plate IV, though the limits of the radial and ulna areas are not with certainty definable.

*The scaphoid* articulates with the lunar by two facets separated from each other by a roughened trough. The superior scapho-lunar facet is long and narrow, its short axis vertical and straight, while its longer axis sweeps to the rear in a gentle convexity. It has the same antero-posterior extent as the scapho-radial facet above. The inferior scapho-lunar facet is much smaller, having but half the fore and aft extent of the superior. Distally the scaphoid articulates with the trapezoid and the magnum, and together with the lunar forms the deep groove into which the pulley-like pivot of the magnum fits.

*The lunar* is a somewhat larger bone than the scaphoid, articulating distally both with the magnum and the unciform. The articulation between the lunar and cuneiform is again double, the two facets being separated by a well-defined channel, which runs backward and slightly upward. The two lunar-cuneiform facets are about equal in area. One can form a very good idea of the distal lunar facets by the study of their complementary facets figured in Plate IV, Fig. 2.

*The cuneiform* is about half the bulk of the lunar, and presents two facets on its inner face in every way the complements of the lunar-cuneiform. On the proximal face there is a large, saddle-shaped facet for the ulnar, and a smaller, semicircular, cuneiform-pisiform facet in the rear, set almost at right angles with the plane of the first. Distally there is a large cuneiform-unciform facet, having the general form of an equilateral triangle with rounded angles. It is again saddle-shaped, concave in its fore and aft axis.

*The pisiform* is lacking from the right manus, but that of the left is present and well preserved. It is much compressed laterally, with a deep vertical expansion of the distal end which is decidedly rugose. The bone presents a gentle, sweeping curve through an arc of nearly 90°. Proximally it bears two well-defined contiguous facets for articulation with the cuneiform and ulna respectively.

Of the distal row of carpals the trapezoid is absent, having been replaced in the mount by that from another individual. It is not a precise fit, there being some variation between its facets and those of the original bone.

The articular faces are well shown in the figure, and it will be noted that lateral movement is impossible, while a remarkable range of flexion is indicated.

*The magnum* has on its lower face facets for the articulation of meta-carpals 2 and 3, that for 2 being rectangular, about four times as long as wide. The pivot of the magnum is high and prominent, as indicated in the figure.

*The unciform* is the largest bone in the carpus, with the possible exception of the lunar. Distally it bears two facets for metacarpals 4 and 5, while on the radial side there is one which articulates both with the magnum and with metacarpal 3, the limits of the two articulations not being discernible.

A study of the distal carpal facets and the proximal metacarpal ones gives evidence again of more or less fore and aft movement, but in the case of the median metacarpals no lateral movement at all. The lateral metacarpals, on the contrary, were capable of lateral as well as fore and aft movement, so that, while the foot would spread somewhat when the creature's weight was borne upon it, it was all in the lateral bones. This would seem to be still further evidence that the true axis of the foot was between digits 3 and 4, as in the artiodactyls.

The principal dimensions of the manus are:

Width of proximal facets	-	-	-	-	-	-	-	0.170
Width of distal carpals	-	-	-	-	-	-	-	.170
Depth, lunar to summit of metacarpal 3	-	-	-	-	-	-	-	.080
Length of metacarpal 3	-	-	-	-	-	-	-	.250

#### THE HIND LIMB

The entire limb is figured in Plate IV, Fig. 4. There was no trace of the pelvis found associated with No. 327, though the limbs are in excellent preservation and give but little evidence of distortion by crushing.

*The femur*.—This is a fine bone, notable for its extreme flatness, which indicates the pillar-like posture of the bone, as in the elephant,

as the shaft would not have been sufficiently rigid to withstand springing, had the thigh been flexed. Another interesting feature is the absence of a third trochanter—a character given by Marsh in his definition of the genus *Megacerops*. There is a ridge on the outer side of the femur continuous above with the great trochanter, which probably represents the vestige of the third.

The measurements are:

Length	-	-	-	-	-	-	-	-	-	0.785
Width of proximal end	-	-	-	-	-	-	-	-	-	.236
Width of distal end	-	-	-	-	-	-	-	-	-	.204
Width of mid shaft	-	-	-	-	-	-	-	-	-	.117
Depth of mid shaft	-	-	-	-	-	-	-	-	-	.060

*The tibia.*—The general form of this bone is well shown in the figure, and calls for no special comment.

The measurements of the tibia are:

Length	-	-	-	-	-	-	-	-	-	0.446
Width of proximal end	-	-	-	-	-	-	-	-	-	.200
Depth of proximal end	-	-	-	-	-	-	-	-	-	.132
Width of mid shaft	-	-	-	-	-	-	-	-	-	.080
Depth of mid shaft	-	-	-	-	-	-	-	-	-	.077

*The fibula* is quite slender with expanded articular extremities.

Length	-	-	-	-	-	-	-	-	-	0.395
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*The pes.*—The general proportions are in keeping with those of the manus. All of the tarsal elements are represented, with the exception of the entocuneiform which is entirely lacking.

*The calcaneum.*—The tuberosity is rather long and very rugous at its distal end, and with a much-flattened shaft which is about one-half as wide as long. The calcaneum bears facets for articulation with the cuboid, the astragalus, and on its upper outer face a small one for the articulation with the fibula.

The calcaneo-astragalar facet is somewhat saddle-shaped, its fore-and-aft axis being a reversed curve, first concave, then convex. The sustentacular facet, however, is deeply concave, the transverse axis curving through an arc of 90°, while the fore and aft axis is straight. Below there is but one facet, the calcaneo-cuboid, somewhat semilunar in shape, extending about half the width of the bone. Except for the articulation with the fibula, there is little evidence of movement between the calcaneum and the adjoining bones.

*The astragalus* presents a beautiful hour-glass-shaped, astragalo-tibial facet, bearing on its outer face a clearly defined fibula facet. The range of flexion and extension in the tibio-tarsal joint is considerable. Distally two facets are indicated, that for the navicular being by far the larger, and somewhat flattened, and with a small, prominent, downwardly projecting process, which effectually limits any fore-and-aft motion. A prominent ridge divides the two facets, that for the cuboid being an elongated triangle, first convex, and then concave from before backward.

*The navicular* is very flat and presents two distal facets, that for the ectocuneiform being the larger, and somewhat triangular in shape, while that of the mesocuneiform is semilunar, the line of demarcation between the two being almost straight.

*The cuboid* has a thickness equal to that of the navicular and ectocuneiform combined, and exhibits proximally two contiguous facets, the lesser for the calcaneum and the greater for the astragalus. Distally there are two facets, the external, the area of which is about four times the greater, being for metatarsal 4. This is somewhat saddle-shaped, while the other, that of metatarsal 3, is nearly flat.

*The ectocuneiform* is absent in the right pes, though present in the left, being replaced in the former by that of another individual. It articulates distally with metatarsals 3 and 2, though the latter articulation almost fades out anteriorly, broadening as one goes to the rear. This is markedly different from most titanotheres feet which the author has seen, in which a wide line of contact is indicated on the face of the tarsus. There is, however, no possibility of contact between the mesocuneiform and metatarsal 3, as the former articulates distally with metatarsal 2 only.

The whole pes is remarkably rigid when compared with the manus, as there is little indication of any intertarsal movement, none between the tarsus and the median metatarsal, and no lateral and but little fore-and-aft play between the tarsus and the lateral metatarsals.

The principal dimensions of the pes are:

Width of astragalar facet	-	-	-	-	-	-	-	0.105
Length of calcaneum	-	-	-	-	-	-	-	.208
Width of the distal row of tarsals	-	-	-	-	-	-	-	.140
Height, astragalus to proximal end of the third metatarsal								.108
Length of the third metatarsal	-	-	-	-	-	-	-	.205

## CONCLUSION

The general proportions of the skeleton would indicate a huge animal, seven feet four inches in height to the withers, and something over twelve feet in length, somewhat rhinoceros-like in aspect, but with more massive, pillar-like limbs, which, as Professor Osborn has shown, are correlated with great weight. The extreme flexibility of the carpus seems to indicate an elephant-like habit of kneeling on the wrists when rising and lying down. The creature was hardly adult, as indicated by the unossified vertebral epiphyses, though probably of full stature, and it indicated a form in the middle stage of evolution—a noble example of a splendid, though unfortunate, race. It is the author's privilege to dedicate this species to Professor John M. Tyler, of Amherst College, a teacher of men, who, by his earnest efforts as well as by his own generosity, was mainly instrumental in making possible the expedition which secured the specimen.

## DESCRIPTION OF PLATES

## PLATE III

FIG. 1.—Dorsal aspect of the skull of *Megacerops tyleri*. Drawn from the type specimen, No. 327 of the Amherst College Zoölogical Collection. The missing portion restored in outline. One-eighth natural size.

FIG. 2.—Lateral aspect of the skull and jaw of *Megacerops tyleri*, drawn from the type. One-eighth natural size.

FIG. 3.—Anterior aspect of the horns and nasals of *Megacerops tyleri*, drawn from the type. One-eighth natural size.

FIG. 4.—Incisor, canine, premolar series of upper teeth of *Megacerops tyleri*, drawn from the type. One-fourth natural size.

## PLATE IV

FIG. 1.—Proximal aspect of the proximal row of carpals of *Megacerops tyleri*, drawn from the type specimen, No. 327 of the Amherst College Zoölogical Collection. One-fourth natural size.

*sc.*, scaphoid; *lu.*, lunar; *cn.*, cuneiform.

FIG. 2.—Proximal aspect of the distal row of carpals of *Megacerops tyleri*, drawn from the type. One-fourth natural size.

*td.*, trapezoid (drawn from that of another specimen); *mg.*, magnum; *unc.*, unciform; *sc. f.*, scaphoid facet; *lu. f.*, lunar facet; *cn. f.*, cuneiform facet.

FIG. 3.—Right manus of *Megacerops tyleri*, drawn from the type specimen. Let-  
tering as above. One-fourth natural size.

FIG. 4.—Right hind limb of *Megacerops tyleri*, drawn from the type. One-eighth natural size.

*cal.*, calcaneum; *as.*, astragalus; *cb.*, cuboid; *na.*, navicular; *cn<sup>2</sup>.*, mesocuneiform; *cn<sup>3</sup>.*, ectocuneiform.

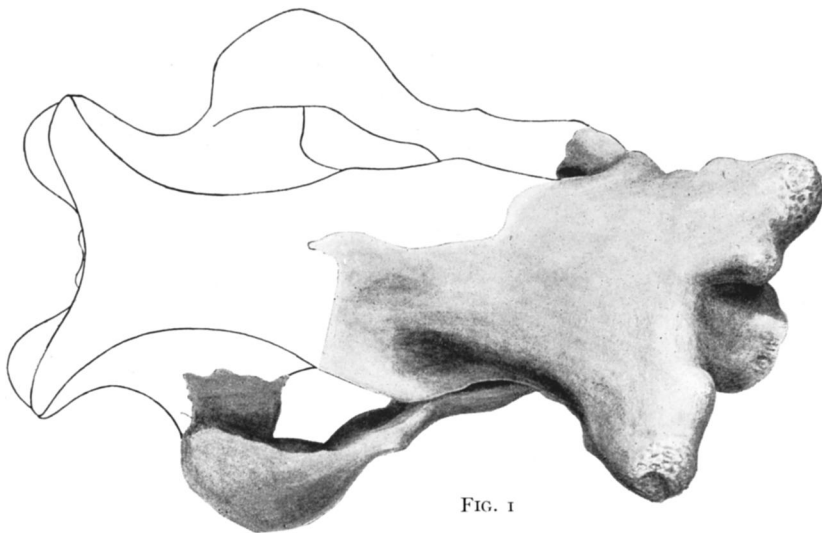


FIG. 1

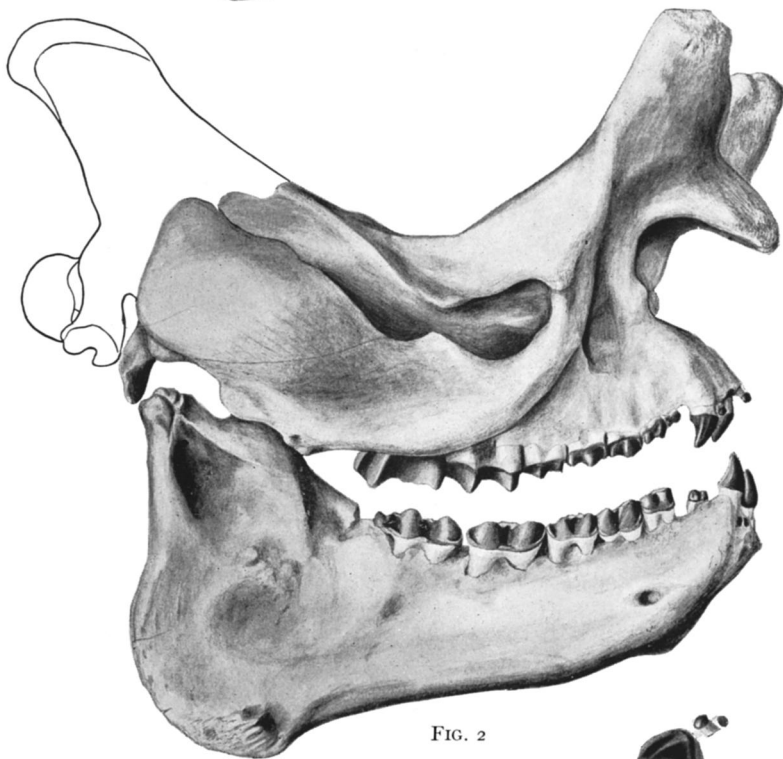


FIG. 2



R. S. LULL, del. ad. nat. FIG. 3



FIG. 4



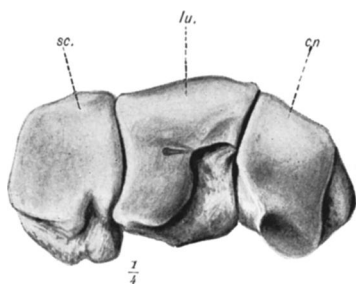


FIG. 1

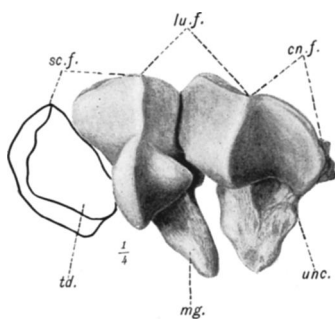


FIG. 2

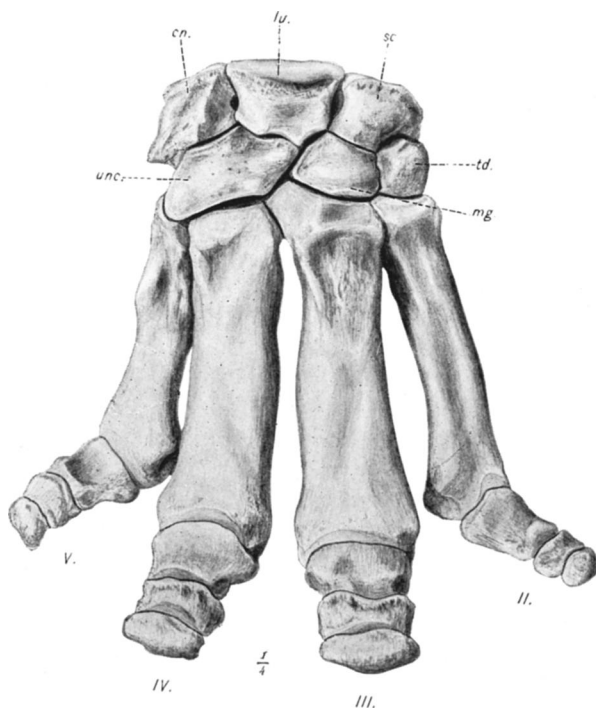


FIG. 3

R. S. LULL, del. ad. nat.



FIG. 4